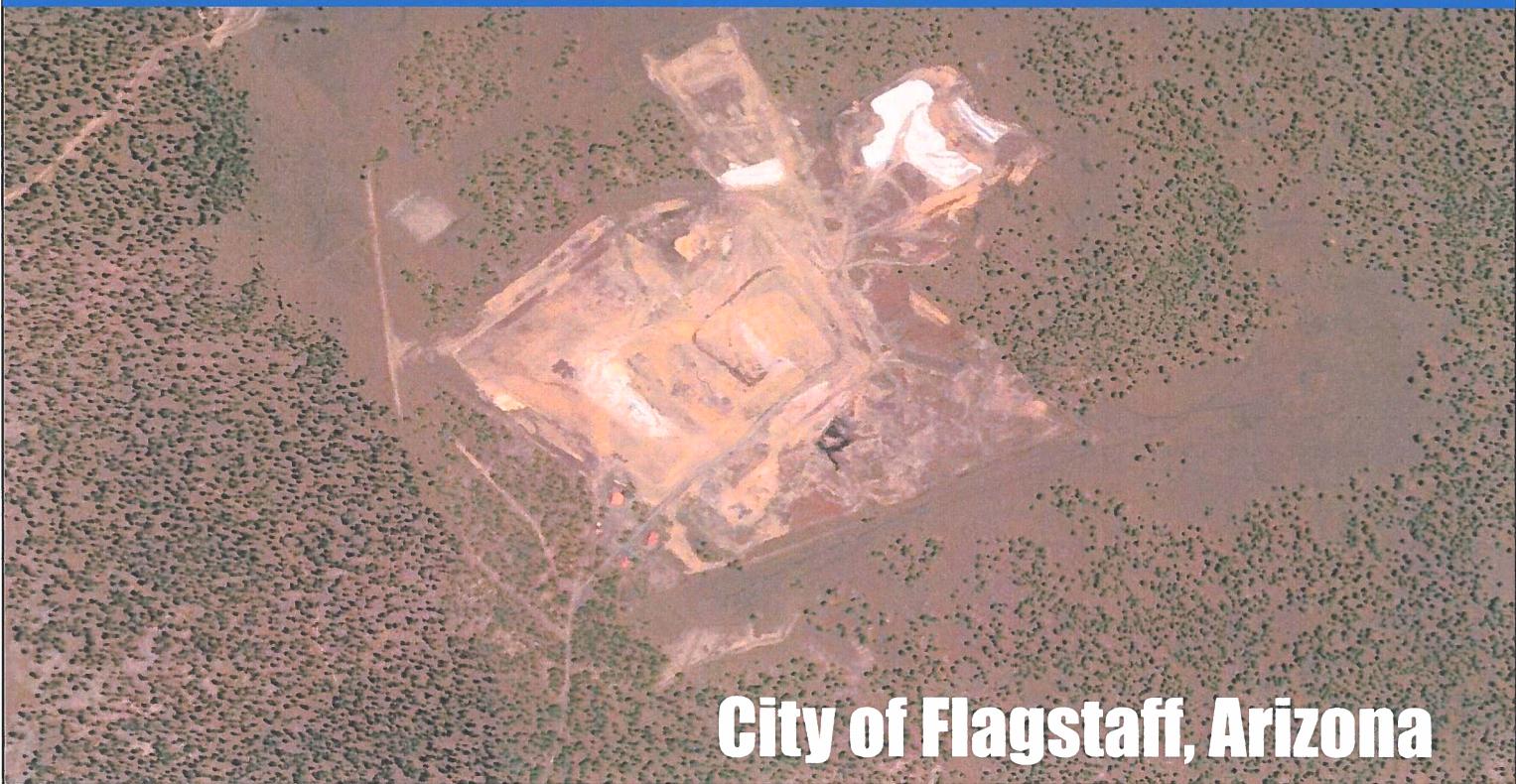


## *Tier 2 NMOC Emissions Report*



# **City of Flagstaff, Arizona Cinder Lake Municipal Landfill**

**October 2018**

**Submitted To:**

Matt Morales, P.E.  
City of Flagstaff  
6770E. Landfill Road  
Flagstaff, Arizona 86004

**Submitted By:**

Tetra Tech BAS, Inc.  
3822 East University Drive, Suite 2  
Phoenix, Arizona 85034  
602.267.0336

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## EXECUTIVE SUMMARY

Tetra Tech, Inc. performed a Tier 2 evaluation of the Cinder Lake Landfill (CLL), a solid waste landfill facility owned and operated by the City of Flagstaff, Arizona. The Tier 2 evaluation activities were conducted in accordance with the New Source Performance Standards (NSPS) regulations in Title 40 Code of Federal Regulations (CFR) Part 60, Subpart WWW, Standards of Performance for New Stationary Sources for municipal solid waste (MSW) landfills.

Field sampling activities were conducted from October 9, 2018 through October 10, 2018. A total of thirty-eight (38) sampling locations were selected over areas of the CLL with solid waste in place for more than two (2) years. A direct push sampling rig (Geoprobe™) was used to drive sample probes beyond one (1) meter below the landfill surface to a sufficient depth suitable for the collection of landfill gas samples. Typical sampling depth for the probes was ten feet. Samples from the 38 probe locations were composited in thirteen (13) summa canisters for laboratory analysis consistent with Tier 2 protocols.

Sample composition was analyzed in the field using a Landtec GEM 5000 Landfill Gas Analyzer. All samples collected had acceptable levels of oxygen. All samples collected were analyzed by AccuLabs, Inc. for concentrations of methane, carbon dioxide, oxygen, and nitrogen by methods consistent with the U.S. Environmental Protection Agency (USEPA) Method TO-3, and for total non-methane organic compounds (NMOCs) consistent with US EPA Method 25C.

Laboratory results indicate an average NMOC concentration of 259 parts per million by volume as hexane (ppmv as hexane). The US EPA LandGEM Model was used to estimate NMOC emission rates using the site-specific NMOC concentrations in lieu of the Clean Air Act (CAA) default value of 4,000 ppmv as hexane. The estimated NMOC emission rate for the CLL for 2019 is 19.82 megagrams per year (Mg/yr) and is not projected to exceed the regulatory threshold of 50 Mg/yr during the next five-year period.

## 1.0 INTRODUCTION

This report summarizes the field sampling, analytical results, and non-methane organic carbon (NMOC) emission estimates in support of a Tier 2 evaluation for the Cinder Lake Landfill (CLL), a solid waste landfill located at 6770 Landfill Road, Flagstaff, Arizona. The CLL is located approximately 12 miles northeast of Flagstaff, and approximately 1 mile east of U.S. Highway 89 within the northwest quadrant of Section 11, Range 8 East, Township 22 North of Coconino County, Arizona.

CLL is located on National Forest Service System (USFS) lands and is authorized by a special use permit. The facility is operated by the City of Flagstaff and is Coconino County's primary municipal solid waste disposal facility. CLL currently comprises 215 acres, of which 43 acres are active waste footprint.

Based on available records it appears that the site began operations on December 10, 1963, the date that the USFS (Permit No. 53) was issued. The site was initially used as a borrow source for cinders. MSW landfilling likely began in 1965. Additions to the leased area occurred in 1975, 1979, 1981, and 1986.

From 1965 to the mid-1980s a dragline was used to excavate soil from trenches. The trenches were then filled with MSW. Trenches ranged from 60 to 80 feet in width and were approximately 25 to 35 feet deep. MSW was dumped into the trenches with only minor compaction. In the early 1980's, City engineers estimated in-place MSW density of 500 pounds/cubic yard at CLL.

In 1985 a compactor was purchased and in 1990/91 a scraper and D-8 were purchased to replace the dragline operation. At that point, trenching was discontinued and CLL became a cut and fill operation. Current operations consist of area filling over the existing established waste footprint.

## 2.0 SUMMARY OF FIELD SAMPLING ACTIVITIES

The sampling, laboratory analysis, and Tier 2 reporting was conducted in accordance with the New Source Performance Standards (NSPS) regulations in Title 40 Code of Federal Regulations (CFR) Part 60, Subpart WWW, Standards of Performance for New Stationary Sources for municipal solid waste (MSW) landfills. All NMOC emission estimates contained in this report were prepared in accordance with the protocol specified by the USEPA per 40CFR §60.754(a)(1)(i), and 40CFR §60.757(b)(2).

According to 40CFR §60.754(a)(3), a landfill owner or operator shall install at least two sample probes per hectare of landfill surface that has retained waste for at least two years. Also, the sample probes should be located to avoid known areas of nondegradable solid waste. The active CLL waste footprint is approximately 43 acres or 17.4 hectares. Therefore, sampling activities for CLL will include a minimum of 35 sample probes to determine the nonmethane organic compound concentration.<sup>1</sup> A total of 38 probes were actually installed. See Figure 1 for the location of the sample probes.

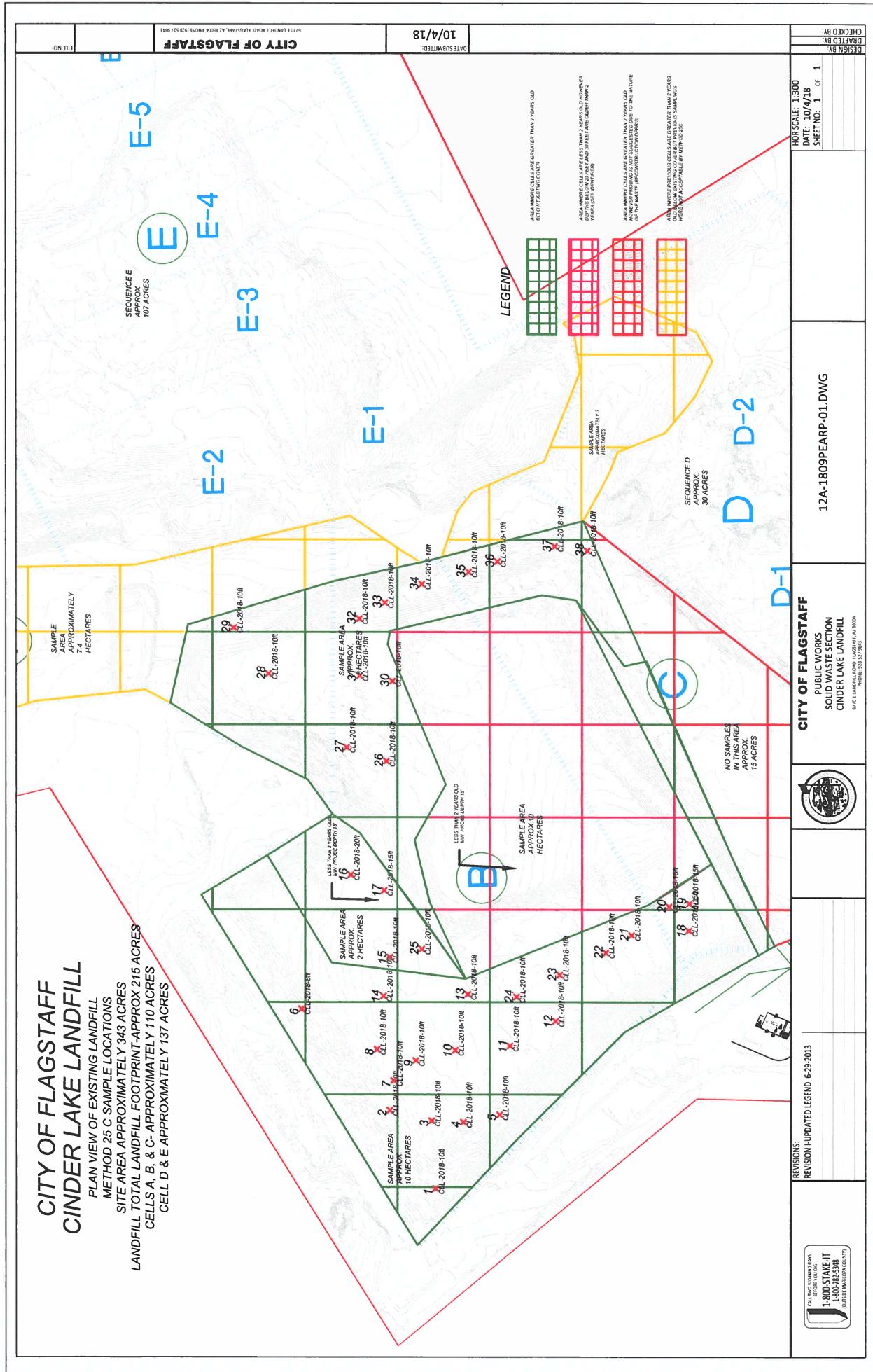


Figure 1: Cinder Lake Landfill Tier 2 sampling probe location map

Table 1 Summary of Field Sampling Results

Probe #	Sample Date	Time	CH <sub>4</sub>	CO <sub>2</sub>	O <sub>2</sub>	Bal	Baro Press
1	10/9/18	1532	57.7	34.9	0.1	7.3	23.36
2	10/9/18	1133	59.8	32.1	0.1	8.0	23.39
3	10/9/18	1016	49.7	35.4	1.7	13.2	23.39
4	10/9/18	1003	55.3	36.9	0.1	7.7	23.40
5	10/9/18	1516	48.4	34.8	2.2	14.6	23.36
6	10/10/18	0721	61.4	31.4	0.2	7.0	23.43
7	10/9/18	1031	59.0	33.3	0.1	7.6	23.39
8	10/9/18	1056	59.7	32.6	0.0	7.7	23.40
9	10/9/18	1113	55.2	33.8	0.8	10.2	23.38
10	10/9/18	1224	58.4	33.0	0.2	8.4	23.37
11	10/9/18	1210	54.8	36.0	0.1	9.1	23.38
12	10/9/18	1158	53.3	38.1	0.1	8.5	23.38
13	10/9/18	1239	59.6	32.0	0.0	8.4	23.37
14	10/10/18	0748	56.3	37.2	0.2	6.3	23.42
15	10/10/18	0803	56.0	37.1	0.1	6.8	23.42
16	10/10/18	0909	55.6	37.5	0.2	6.7	23.42
18	10/9/18	1456	54.2	38.0	0.1	7.7	23.36
19	10/9/18	1433	56.0	38.1	0.1	5.8	23.35
20	10/9/18	1415	53.6	39.5	0.1	6.8	23.34
21	10/9/18	1402	54.7	37.7	0.1	7.5	23.34
22	10/9/18	1327	53.2	39.9	0.0	6.9	23.36
23	10/9/18	1307	51.8	39.9	0.1	8.2	23.35
24	10/9/18	1251	57.4	34.1	0.1	8.4	23.37
25	10/10/18	0825	55.6	38.4	0.0	6.0	23.41
26	10/10/18	0930	51.2	39.9	0.1	8.8	23.40
27	10/10/18	0941	54.8	38.6	0.1	6.5	23.40
28	10/10/18	0955	54.7	38.6	0.1	6.6	23.42
29	10/10/18	1048	59.4	32.8	0.1	7.7	23.43
30	10/10/18	1020	55.5	37.6	0.1	6.8	23.41
31	10/10/18	1009	53.6	39.8	0.1	6.5	23.41
32	10/10/18	1033	53.1	40.5	0.1	6.3	23.42
33	10/10/18	1104	52.6	39.9	0.1	7.4	23.41
34	10/10/18	1118	53.9	38.7	0.1	7.3	23.43
35	10/10/18	1130	53.6	38.6	0.1	7.7	23.44
36	10/10/18	1148	52.9	38.8	0.1	8.2	23.45
37	10/10/18	1201	53.7	39.3	0.1	6.9	23.45
38	10/10/18	1217	59.3	40.7	0.0	0.0	23.45

Table 2 contains information regarding which probes were sampled in each 6 liter summa canister. Equal sample volumes were obtained from each probe listed below.

**Table 2 Probe Composite Sampling**

Composite Sample Container ID	Probe Sample Numbers	Composite Sample Container ID	Probe Sample Numbers
5955	3, 4, 7	6622	8, 9, 2
5941	12, 11, 10	7048	13, 24, 23
7039	22, 21, 20	7037	19, 18, 5
5946	1, 6, 14	7053	15, 25, 17
7034	16, 26, 27	6615	28, 31, 30
7041	32, 29, 33	7057	34, 35, 36
7046	37, 38		

### 3.0 LABORATORY RESULTS

All laboratory analysis was performed by AccuLabs, Inc. (AL). NMOC concentrations were calculated from raw laboratory analytical data in accordance with USEPA Method 25C and Methane (CH<sub>4</sub>) and fixed gases were calculated in accordance with USEPA Method TO-3. Table 1 provides a summary of field compositions for each probe.

US EPA Method 25C states that the LFG sample is acceptable if the concentration of nitrogen (N<sub>2</sub>) is less than 20% or, alternatively, the oxygen content of each cylinder must be less than 5% in order to eliminate samples with unacceptable amounts of air infiltration. The US EPA acknowledges some amount of air infiltration and provides corrections for air infiltration for LFG measured pollutant concentrations<sup>ii</sup>. All sampling canisters for the CLL reflect oxygen levels well below the 5% sampling criteria threshold as required by EPA Method 25C.

Landfills located in dry climates are typically associated with elevated nitrogen concentrations in the LFG samples. The US EPA Method 25C contains adjustments for air intrusion. When site-specific NMOC concentrations are available the necessary equation is as follows:

$$C_p \text{ (corrected)} = \frac{C_p}{C_{CO_2} + C_{CH_4}} \quad (\text{Equation 2-2})$$

Where:

$C_p$  = Concentration of NMOC in the LFG, ppmv as hexane

$C_{CO_2}$  = CO<sub>2</sub> concentration in the LFG, % by volume

$C_{CH_4}$  = CH<sub>4</sub> concentration in the LFG, % by volume

$C_p$  (corrected) = Concentration of NMOC corrected for air infiltration, ppmv

Note: Assumes that CO<sub>2</sub> and CH<sub>4</sub> are the primary (100 percent) constituents of LFG

US EPA Method 25C stipulates that when the method is used to analyze samples to demonstrate compliance with a source emission regulation, an audit sample, if available, must be analyzed. The concentrations of the audit samples must agree within 20% of the actual concentration. Appendix B includes laboratory reported results and audit sample Quality Control (QC) results that show agreement within 1.5% for all test parameters.

Table 3 contains the laboratory analytical results and the corrected NMOC values. The corrected NMOC values account for ambient air infiltration (dilution) of the sample. The site-specific average corrected NMOC value must be used in place of the LandGEM default NMOC value.

**Table 3 Summary of Laboratory Analytical Results**

Composite Sample Container ID	Probe Sample Numbers	TO-3 Results CH <sub>4</sub> (%)	TO-3 Results CO <sub>2</sub> (%)	TO-3 Results O <sub>2</sub> (%)	TO-3 Results N <sub>2</sub> (%)	Air Infiltration Correction (CH <sub>4</sub> +CO <sub>2</sub> )/100	EPA 25C Results (ppmv as Hexane)	EPA 25C Results Corrected (ppmv as Hexane)
5955	3, 4, 7	61.5	34.9	1	2.6	0.964	177	184
5941	12, 11, 10	62.1	34.8	0.64	2.1	0.969	169	174
7039	22, 21, 20	58.7	38.2	0.5	2.3	0.969	230	237
5946	1, 6, 14	66.3	32	0.4	1.3	0.983	161	164
7034	16, 26, 27	60.2	36.8	0.3	2.5	0.97	354	365
7041	32, 29, 33	60.4	35.9	0.8	2.8	0.963	242	251
6622	8, 9, 2	66.2	32.8	0.3	0.7	0.99	153	155
7048	13, 24, 23	64.5	34.9	0.2	0.4	0.994	217	218
7037	19, 18, 5	58.9	35.3	1.2	4.2	0.942	306	325
7053	15, 25, 17	61.2	36.2	0.4	2.1	0.974	217	223
6615	28, 31, 30	60.3	36.7	0.4	2.5	0.97	262	270
7057	34, 35, 36	58.6	34.7	1.1	5.3	0.933	321	344
7046	37, 38	57	38	0.3	4.5	0.95	432	455
Average Value =		61	35	1	3		249	259

#### 4.0 NMOC EMISSION RATE ESTIMATES

USEPA *Landfill Air Emissions Estimation Model* (Model)<sup>iii</sup> was used to quantify emissions from the decomposition of landfilled waste at the CLL. Site-specific average NMOC concentration of 259 ppm<sub>v</sub> as hexane, described in Section 2.0, was used as input for the LandGEM model in accordance with Tier 2 protocol in lieu of the NSPS default value of 4,000 ppmv. The following equation is stipulated in 40 CFR 60.754 for estimating the NMOC emission rate for landfills where the actual year-to-year solid waste acceptance rate is known:

$$M_{NMOC} = \sum_{i=1}^n 2kL_0 M_i (e^{-kt_i}) (C_{NMOC}) (3.6 \times 10^{-9})$$

Where,

$M_{NMOC}$	=	Total NMOC emission rate from the landfill (Mg/yr)
$k$	=	Methane generation rate constant ( $\text{yr}^{-1}$ ) = 0.02 $\text{yr}^{-1}$ (For arid climates per US EPA)
$L_0$	=	Methane generation potential ( $\text{m}^3/\text{Mg}$ ) = 170 $\text{m}^3/\text{Mg}$
$M_i$	=	Mass of solid waste in the $i^{\text{th}}$ section (Mg)
$t_i$	=	Age of the $i^{\text{th}}$ section (yrs)
$C_{NMOC}$	=	Concentration of NMOC, parts per million by volume as hexane
$3.6 \times 10^{-9}$	=	Conversion factor

The LandGEM model guidance document stipulates use of a methane generation constant,  $k$ , of 0.02 for landfills located in area that receive less than 25 inches of rainfall per year.

Total annual precipitation data has been tabulated from the Sunset Crater cooperative weather Station. The mean total annual precipitation for this station was approximately 17.1 inches during the period 1970 through 1995 (NOAA, 1993, Western Regional Climate Center, 1998)<sup>iv</sup>; therefore a value of 0.02  $\text{yr}^{-1}$  can be used in the LandGEM model. The value for methane generation potential,  $L_0$ , used in the LandGEM model is the default Clean Air Act (CAA)  $L_0$  value for conventional landfills.

Data used to compile the mass of solid waste in place,  $M_i$ , includes estimates based on the Woodward-Clyde Facility Plan dated May 1998. A scale was installed at the CLL in 1985. The remainder of the solid waste accepted data was obtained from the November 2017 Cornerstone report. A complete table of the solid waste accepted data is included in Appendix C. The NMOC emission rates for the next 5-year period that assumes CLL continues to accept waste at the rates shown in Appendix C.

The input parameters summarized above were used as input for the CLL LandGEM model. Appendix D displays the LandGEM model results of projected yearly NMOC emissions. The results show the estimated NMOC emission rate for 2019 to be 16.97 Mg/yr. The corresponding estimated NMOC emission rate for 2023 from the LandGEM model is 22.99 Mg/yr. Table 2, below, shows the estimated NMOC emission rates from 2010 to 2015. A complete listing of estimated NMOC emission rates per year is included in Appendix D.

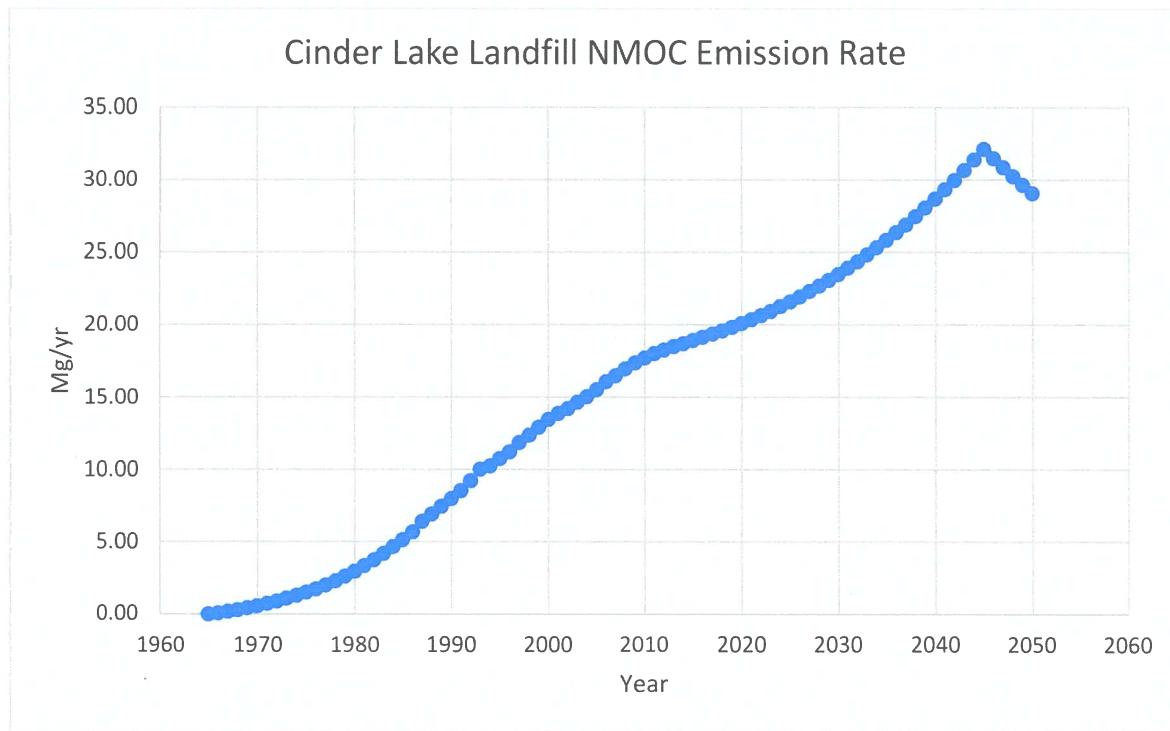
**Table 4 Five-Year Estimated NMOC Emission Rates**

YEAR	NMOC EMISSION RATE (Mg/Yr)
2019	19.82
2020	20.08
2021	20.35
2022	20.64
2023	20.94

As shown in Table 4, the CLL is not anticipated to exceed the 50 Mg/yr threshold during the next five (5) year period. These NMOC emission rates can be relied upon for purposes of NSPS compliance purposes. A five-year estimate of NMOC emissions is allowed under the NSPS in lieu of annual reporting if NMOC emission estimates are less than 50 Mg/yr for each of the five years. Waste acceptance rates would need to more than double in order for the estimated NMOC emission rate for CLL to reach the 50 Mg/Yr threshold in 2024.

Figure 2 presents a graphical representation of the LandGEM estimated NMOC emission rates from 1965 thru 2044. As shown in Figure 2 the estimated and forecasted NMOC emission rates for the CLL are well below the 50 Mg/yr NSPS threshold. Additional Tier 2 sampling and analysis can be completed in 2024 after the five-year period has elapsed.

Figure 2 LandGEM Estimated NMOC Emission Rates for CLL from 1965



## LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

## 5.0 REFERENCES

- <sup>i</sup> City of Flagstaff Cinder Lake Landfill, Overall Site Map, prepared by the City of Flagstaff.
- <sup>ii</sup> U.S. Environmental Protection Agency (US EPA), "Background Information Document for Updating AP42 Section 2.4 for Estimating Emissions from Municipal Solid Waste Landfills, EPA/600/R-08-116, September 2008 (Section 2.2, Page 10).
- <sup>iii</sup> Landfill Gas Emissions Model (LandGEM) Version 3.02 User's Guide, EPA-600/R-05/047, May 2005.
- <sup>iv</sup> U.S. Department of Commerce, National Oceanic & Atmospheric Administration, National Environmental Satellite, Data and Information Service.

# Appendix A

## Field Sampling Log

GEM READINGS  
CINDER LAKE LANDFILL  
OCT 9-10, 2018

Sample #	Date	Time	CH4	CO2	O2	Bal	Baro Press
4	10/9/18	1003	55.3	36.9	0.1	7.7	23.40
3	10/9/18	1016	49.7	35.4	1.7	13.2	23.39
7	10/9/18	1031	59.0	33.3	0.1	7.6	23.39
8	10/9/18	1056	59.7	32.6	0.0	7.7	23.40
9	10/9/18	1113	55.2	33.8	0.8	10.2	23.38
2	10/9/18	1133	59.8	32.1	0.1	8.0	23.39
12	10/9/18	1158	53.3	38.1	0.1	8.5	23.38
11	10/9/18	1210	54.8	36.0	0.1	9.1	23.38
10	10/9/18	1224	58.4	33.0	0.2	8.4	23.37
13	10/9/18	1239	59.6	32.0	0.0	8.4	23.37
24	10/9/18	1251	57.4	34.1	0.1	8.4	23.37
23	10/9/18	1307	51.8	39.9	0.1	8.2	23.35
22	10/9/18	1327	53.2	39.9	0.0	6.9	23.36
21	10/9/18	1402	54.7	37.7	0.1	7.5	23.34
20	10/9/18	1415	53.6	39.5	0.1	6.8	23.34
19	10/9/18	1433	56.0	38.1	0.1	5.8	23.35
18	10/9/18	1456	54.2	38.0	0.1	7.7	23.36
5	10/9/18	1516	48.4	34.8	2.2	14.6	23.36
1	10/9/18	1532	57.7	34.9	0.1	7.3	23.36
6	10/10/18	0721	61.4	31.4	0.2	7.0	23.43
14	10/10/18	0748	56.3	37.2	0.2	6.3	23.42
15	10/10/18	0803	56.0	37.1	0.1	6.8	23.42
25	10/10/18	0825	55.6	38.4	0.0	6.0	23.41
17	10/10/18	0843	55.8	37.8	0.1	6.3	23.42
16	10/10/18	0909	55.6	37.5	0.2	6.7	23.42
26	10/10/18	0930	51.2	39.9	0.1	8.8	23.40
27	10/10/18	0941	54.8	38.6	0.1	6.5	23.40
28	10/10/18	0955	54.7	38.6	0.1	6.6	23.42
31	10/10/18	1009	53.6	39.8	0.1	6.5	23.41
30	10/10/18	1020	55.5	37.6	0.1	6.8	23.41
32	10/10/18	1033	53.1	40.5	0.1	6.3	23.42
29	10/10/18	1048	59.4	32.8	0.1	7.7	23.43
33	10/10/18	1104	52.6	39.9	0.1	7.4	23.41
34	10/10/18	1118	53.9	38.7	0.1	7.3	23.43
35	10/10/18	1130	53.6	38.6	0.1	7.7	23.44
36	10/10/18	1148	52.9	38.8	0.1	8.2	23.45
37	10/10/18	1201	53.7	39.3	0.1	6.9	23.45
38	10/10/18	1217	59.3	40.7	0.0	0.0	23.45

**Appendix B**  
**Laboratory Analysis Results, Quality Control**  
**Data, Custody Forms, and Summa,**  
**Canisters Tracking Records**



# AccuLabs, Inc.

Air Toxic • Contaminated Soil • Water and Wastewater • Industrial and Hazardous Waste • Chemical Consultation

Date: October 24, 2018

Mr. Keith Johnson, Regional Manager  
Mr. Jose Velez, Field Manager  
Mr. Todd Livermore, Project Manager  
Tetra Tech BAS  
3822 E. University Drive, Suite 2  
Phoenix, AZ 85034

Re: Tetra Tech BAS: Cinder Lake Landfill, Tier 2 NMOC Testing / BAS Project ID: *Pending*  
AccuLabs Task Order Number: AL-18-10-0015 / BAS P.O. Number: *Pending*

Dear Mr. Johnson, Mr. Velez and Mr. Livermore:

Enclosed was the analytical report for the thirteen gas samples from Cinder Lake Landfill, Flagstaff, Arizona regarding Tier 2 NMOC testing.

The designated thirteen samples were collected by Mr. Jim Albrecht of BAS on October 9 to 10, 2018 and were received at AccuLabs on October 16, 2018. They were analyzed for Permanent Gases test by EPA Method 3C on October 16, 2018; followed by TGNMNEO test by EPA Method 25C on October 17, 2018 respectively.

The data package was arranged with Analytical Results, Internal Duplicate Sample Analyses, Daily QC Data of Method Blank and LCS/LCSD Study, Tracking Record of the Silonited Canisters and ending with the copy of Chain of Custody Form.

Thank you for the opportunity to provide analytical tests to you. Please feel free to call me at (626) 447-1888 / (626) 447-1841 if I can be of further assistance to BAS.

Sincerely,  
AccuLabs, Inc.

  
Ellis Hsue  
Laboratory Director



*AccuLabs, Inc.*

Air Toxic • Contaminated Soil • Water and Wastewater • Industrial and Hazardous Waste • Chemical Consultation

Project Info		Sample Info				Report Info			
Project ID: Tier 2 NMOC		Date Sampled: 10/09-10/18				Lab Batch ID: AL-18090015			
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Received: 10/16/18				Date Reported: 10/24/18			
Client Name: Tetra Tech BAS		Sample Matrix: Air				Reporting Units: ppmV			

Total Gaseous Non-Methane and Non Ethane Organic Compounds by EPA 25.C

Analyte	Client Sample ID	Lab ID	MDL	RL	TGNMNEO as				Date
					TGNMNEO as Methane	TGNMNEO as Hexane	Hexane per 3% Oxygen	DF	
TGNMNEO	C.L.- Samples 4,3,7	18100015-01	0.5	1	1060	197	177	1	10/17/18
TGNMNEO	C.L.- Samples 8,9,2	18100015-02	0.5	1	946	176	153	1	10/17/18
TGNMNEO	C.L.- Samples 12,11,10	18100015-03	0.5	1	1030	192	169	1	10/17/18
TGNMNEO	C.L.- Samples 13,24,23	18100015-04	0.5	1	1350	251	217	1	10/17/18
TGNMNEO	C.L.- Samples 22,21,20	18100015-05	0.5	1	1410	262	230	1	10/17/18
TGNMNEO	C.L.- Samples 19,18,5	18100015-06	0.5	1	1810	337	306	1	10/17/18
TGNMNEO	C.L.- Samples 1,6,14	18100015-07	0.5	1	987	184	161	1	10/17/18
TGNMNEO	C.L.- Samples 1,6,14- Dup	18100015-07- Dup	0.5	1	974	181	158	1	10/17/18
									5.6
TGNMNEO	C.L.- Samples 15,25,17	18100015-08	0.5	1	1340	249	217	1	10/17/18
TGNMNEO	C.L.- Samples 16,26,27	18100015-09	0.5	1	2190	407	354	1	10/17/18
TGNMNEO	C.L.- Samples 28,31,30	18100015-10	0.5	1	1620	301	262	1	10/17/18
TGNMNEO	C.L.- Samples 32,29,33	18100015-11	0.5	1	1460	272	242	1	10/17/18
TGNMNEO	C.L.- Samples 34,35,36	18100015-12	0.5	1	1910	355	321	1	10/17/18
TGNMNEO	C.L.- Samples 37,38	18100015-13	0.5	1	2680	498	432	1	10/17/18
TGNMNEO	C.L.- Samples 37,38-Dup.	18090015-13-Dup.	0.5	1	2620	487	423	1	10/17/18
TGNMNEO	Method Blank	10172018-MB	0.5	1	<0.5	NA	NA	1	10/17/18

Key: MDL =Method Detection Limit RL =Reporting Limit J =Trace Conc. between MDL and RL M.B. =Method Blank T.B. =Trip Blank F.B. =Field Blank E.B.= Equipment Blank

\* Note 1: TGNMNEO as Methane, as Hexane and as Hexane per 3% Oxygen

*Elli Hsue*

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Laboratory Director



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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L -Samples 4,3,7</b>				AccuLabs ID: 18100015-01		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: 10/16/18				Reporting Units: % & ppmV		
Sample Matrix: Air								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date		
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.946</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.59</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>34.9</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>61.5</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>610980</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info	Sample Info	Report Info
Project ID: Tier 2 NMOC Sample Site: Cinder Lake Landfill Flagstaff, Arizona Client Name: Tetra Tech BAS	Sample ID: C.L -Samples 8,9,2 Date Sampled: 10/09/18 Date Received: 10/16/18 Sample Matrix: Air	AccuLabs ID: 18100015-02 Date Reported: 10/24/18 Reporting Units: % & ppmV

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date	
			MDL	RL	Result	DF	Method	Analyzed
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18
Oxygen	%	18100015	0.1	0.1	0.325	1	GC/TCD	10/16/18
Nitrogen	%	18100015	0.1	0.1	0.70	1	GC/TCD	10/16/18
Carbon Dioxide	%	18100015	0.1	0.1	32.8	1	GC/TCD	10/16/18
Methane	%	18100015	0.01	0.01	66.2	1	GC/TCD	10/16/18
Methane	ppmV	18100015	0.3	1.0	658335	1	GC/FID	10/16/18

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 12,11,10</b>				AccuLabs ID: 18100015-03		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: 10/16/18				Reporting Units: % & ppmV		
Sample Matrix: Air								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date		
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.633</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.10</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>34.8</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>62.1</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>617006</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 13,24,23</b>				AccuLabs ID: 18100015-04		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

## EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date		
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.16</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>0.42</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>34.9</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>64.5</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>639402</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 22,21,20</b>				AccuLabs ID: 18100015-05		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: 10/16/18				Reporting Units: % & ppmV		
		Sample Matrix: Air						

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample			Date			
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.50</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.28</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>38.2</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>58.7</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>585486</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: C.L.-Samples 19,18,5				AccuLabs ID: 18100015-06		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

## EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample		Date		
					Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	1.19	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	4.21	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	35.3	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	58.9	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	583539	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 1,6,14</b>			AccuLabs ID: 18100015-07			
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18			Date Reported: 10/24/18			
Client Name: Tetra Tech BAS		Date Received: 10/16/18			Reporting Units: % & ppmV			

### EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.42</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>1.28</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>32.0</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>66.3</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>661929</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: C.L.-Samples 15,25,17				AccuLabs ID: 18100015-08		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample			Date			
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.37</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.06</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>36.2</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>61.2</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>608360</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 16,26,27</b>				AccuLabs ID: 18100015-09		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

## EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date		
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.27</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.48</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>36.8</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>60.2</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>598374</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 28,31,30</b>				AccuLabs ID: 18100015-10		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: 10/16/18				Reporting Units: % & ppmV		
Sample Matrix: Air								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample		Date		
					Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.33</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>2.48</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>36.7</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>60.3</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>595091</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: C.L.-Samples 32,29,33				AccuLabs ID: 18100015-11		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample		Date		
					Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	0.80	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	2.82	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	35.9	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	60.4	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	602670	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 34,35,36</b>				AccuLabs ID: 18100015-12		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	Sample				Date		
			MDL	RL	Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>1.08</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>5.27</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>34.7</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>58.6</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>576226</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: <b>C.L.-Samples 37,38</b>				AccuLabs ID: 18100015-13		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV		
Client Name: Tetra Tech BAS								

EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample		Date		
					Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	<b>0.26</b>	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	<b>4.51</b>	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<b>38.0</b>	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<b>57.0</b>	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<b>570296</b>	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: C.L -Samples 4,3,7-Dup.				AccuLabs ID: 18100015-01-Dup.		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/09/18				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: 10/16/18				Reporting Units: % & ppmV		
		Sample Matrix: Air						

EPA 3C / ASTM D-1946

* Duplicate Analysis	Analyte	Units	Batch	MDL	RL	Duplicate	Primary Result	Date Analyzed	RPD	
						Result			(80-120)%	
	Hydrogen	%	18100015	0.1	0.1	<0.1	1	<0.1	10/16/18	NA
	Oxygen	%	18100015	0.1	0.1	<b>0.935</b>	1	<b>0.946</b>	10/16/18	<b>1.2</b>
	Nitrogen	%	18100015	0.1	0.1	<b>2.79</b>	1	<b>2.59</b>	10/16/18	<b>7.4</b>
	Carbon Dioxide	%	18100015	0.1	0.1	<b>35.0</b>	1	<b>34.9</b>	10/16/18	<b>0.3</b>
	Methane	%	18100015	0.1	0.1	<b>60.9</b>	1	<b>61.5</b>	10/16/18	<b>1.0</b>
	Methane	ppmV	18100015	0.3	1.0	<b>607794</b>	1	<b>610980</b>	10/16/18	<b>0.5</b>

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

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Project Info		Sample Info		Report Info			
Project ID: Tier 2 NMOC		Sample ID: C.L.-Samples 37,38-Dup.				AccuLabs ID: 18100015-13-Dup.	
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: 10/10/18 Date Received: 10/16/18 Sample Matrix: Air				Date Reported: 10/24/18 Reporting Units: % & ppmV	
Client Name: Tetra Tech BAS							

EPA 3C / ASTM D-1946

* Duplicate Analysis		Units	Batch	MDL	RL	Duplicate	Primary	Date	RPD
Analyte						Result			(80-120)%
Hydrogen	%	18100015	0.1	0.1	<0.1	1	<0.1	10/16/18	NA
Oxygen	%	18100015	0.1	0.1	0.27		0.26	10/16/18	3.8
Nitrogen	%	18100015	0.1	0.1	4.37		4.51	10/16/18	3.2
Carbon Dioxide	%	18100015	0.1	0.1	38.1		38.0	10/16/18	0.3
Methane	%	18100015	0.1	0.1	57.0		57.0	10/16/18	0.0
Methane	ppmV	18100015	0.3	1.0	568605		570296	10/16/18	0.3

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

AccuLabs, Inc.

Ellis Hsue  
Laboratory Director



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Project Info		Sample Info			Report Info			
Project ID: Tier 2 NMOC		Sample ID: Method Blank				AccuLabs ID: 10162018-FG-MB		
Sample Site: Cinder Lake Landfill Flagstaff, Arizona		Date Sampled: NA				Date Reported: 10/24/18		
Client Name: Tetra Tech BAS		Date Received: NA				Reporting Units: % & ppmV		
		Sample Matrix: Air						

EPA 3C / ASTM D-1946

Analyte	Units	Batch	MDL	RL	Sample		Date		
					Result	DF	Method	Analyzed	Qualifiers
Hydrogen	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Oxygen	%	18100015	0.1	0.1	20.8	1	GC/TCD	10/16/18	
Nitrogen	%	18100015	0.1	0.1	79.0	1	GC/TCD	10/16/18	
Carbon Dioxide	%	18100015	0.1	0.1	<0.1	1	GC/TCD	10/16/18	
Methane	%	18100015	0.01	0.01	<0.01	1	GC/TCD	10/16/18	
Methane	ppmV	18100015	0.3	1.0	<1.0	1	GC/FID	10/16/18	

Key: MDL = Method Detection Limit RL = Reporting Limit J = Trace Conc. between MDL and RL M.B. = Method Blank T.B. = Trip Blank F.B. = Field Blank E.B. = Equipment Blank

AccuLabs, Inc.

*Ellis Hsue*

Ellis Hsue

Laboratory Director



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Project Info	Sample Info	Report Info
Project ID: Tier 2 NMOC Sample Site: Cinder Lake Landfill Flagstaff, Arizona Client Name: Tetra Tech BAS	Date Prepared: 10/16/18 Date Analyzed: 10/16/18 Sample Matrix: Air	AccuLabs Batch ID: 10162018-Fixed Gases-QC Date Reported: 10/24/18 Reporting Units: % & ppmV

Laboratory Control Standards (LCS/LCSD) Studies for Methane and Fixed Gases Test by EPA 3C / ASTM D-1946

AL-10162018-QC for EPA 3CM/ASTM D-1946

Test Parameter	Sample Result	Amount Spiked	LCS Result	LCS % Recovery	LCSD Dup. Result	LCSD % Recovery	QC Limit	% RPD	QC Limit	R.L. % & ppmV	Date Analyzed
Hydrogen (%)	0	4.000	4.067	102	3.896	97	80-120	4.3	20	0.01	10/16/18
Carbon Dioxide (%)	0	5.015	4.983	99	4.872	97	80-120	2.3	20	0.01	10/16/18
Oxygen (%)	0	2.500	2.715	109	2.654	106	80-120	2.3	20	0.01	10/16/18
Nitrogen (%)	0	5.027	5.491	109	5.303	105	80-120	3.5	20	0.1	10/16/18
Methane-TCD (%)	0	4.000	4.099	102	3.934	98	80-120	4.1	20	0.1	10/16/18
Carbon Monoxide	0	5.010	5.235	104	5.209	104	80-120	0.5	20	0.001	10/16/18
<b>Methane-FID (ppmV)</b>	<b>0</b>	<b>40000</b>	<b>39768</b>	<b>99</b>	<b>39989</b>	<b>100</b>	<b>80-120</b>	<b>0.6</b>	<b>20</b>	<b>50</b>	<b>10/16/18</b>

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Silonited Canisters and Vacuum Gauge Tracking Log (with Vacuum Readings)  
for Tetra Tech BAS, Phoenix, Arizona / Cinder Lake, Flagstaff, Tier II Testing / October, 2018 Monitoring

Measured and Calibrated on October 1, 09,10 & 16, 2018

<I>: Six Liter Silonited Canister:

AccuLabs Canister Log #	ENTECH Serial Number	Before Shipment in Labs (" Hg)	At the end of sampling period in Field (" Hg)	Upon sample Receipt in Labs (" Hg)	Comment / Field &/or Laboratory
		<u>10/1/2018</u>	<u>10/9/2018</u>	<u>10/16/2018</u>	
AL-005	CS/N-5955	< -30.0	NA	-6.50"Hg	Samples 4,3,7 / AL-18100015-01
AL-042	CS/N-6622	< -30.0	NA	-6.00"Hg	Samples 8,9,2 / AL-18100015-02
AL-001	CS/N-5941	< -30.0	NA	-6.75"Hg	Samples 12,11,10 / AL-18100015-03
AL-059	CS/N7048	< -30.0	NA	-8.00"Hg	Samples 13,24,23 / AL-18100015-04
AL-050	CS/N-7039	< -30.0	NA	-7.50"Hg	Samples 22,21,20 / AL-18100015-05
AL-048	CS/N-7037	< -30.0	NA	-7.00"Hg	Samples 19,18,5 / AL-18100015-06
			<u>10/10/2018</u>		
AL-006	CS/N-5946	< -30.0	NA	-5.25"Hg	Samples 1,6,14 / AL-18100015-07
AL-064	CS/N-7053	< -30.0	NA	-6.00"Hg	Samples 15,25,17 / AL-18100015-08
AL-045	CS/N-7034	< -30.0	NA	-6.00"Hg	Samples 16,26,27 / AL-18100015-09
AL-038	CS/N-6615	< -30.0	NA	-6.50"Hg	Samples 28,31,30 / AL-18100015-10
AL-052	CS/N-7041	< -30.0	NA	-7.00"Hg	Samples 32,29,33 / AL-18100015-11
AL-068	CS/N-7057	< -30.0	NA	-6.00"Hg	Samples 34,35,36 / AL-18100015-12
AL-057	CS/N-7046	< -30.0	NA	-6.25"Hg	Samples 37,38 / AL-18100015-13
AL-010	CS/N-6608	< -30.0			<i>Not Used</i>
AL-012	CS/N-6610	< -30.0			<i>Not Used</i>
AL-069	CS/N-7058	< -30.0			<i>Not Used</i>
AL-039	CS/N-6616	< -30.0			<i>Not Used</i>

<II>: Vacuum Gauges:

AL-McDaniel Control Gauge 016A  
AL-SwageLok Gauge 012A

Submitted by:

Judy Hsue

Received by:

Jose A. Velez

Keith Johnson

AccuLabs, Inc.

Tetra Tech BAS, Phoenix, AZ.



Tel.: (626) 447-1888 • (626) 447-1841  
Fax: (626) 447-1841

118 La Porte Street Unit C&D Arcadia, CA 91006

## CHAIN OF CUSTODY RECORD

Client Name / Address: City ofFlagstaff (Matt Mueller) Flagstaff AZ 86004		Project Name / Number / Location: Tire 2 N Mcc Cinder Lake Landfill		Special Instructions / Preservatives If Any		
Project Manager: Keith Johnson Tetra Tech BAS 3622 E University Dr Phoenix AZ 85034	Sampler: Jim Albrecht Tetra Tech	Fax: 602-207-0336 Cell:	E-mail: keith.jonathan@tetratech.com			
Client Sample ID / Description	Laboratory ID	**Sample Matrix	Container Type	# of Containers	Sampling Date	Sampling Time
5955 (Samples 4,3,7)				1	10/9/18	10:03 10:31
6622 (Samp. 8,9,2)				1	10/9/18	10:52 11:31
5941 (Samp 12,11,10)				1	10/9/18	12:00 12:20
7048 (Samp 13,24,23)				1	10/9/18	12:41 12:53
7039 (Samp 22,21,20)				1	10/9/18	13:37 13:53
7037 (Samp 19,18,5)				1	10/9/18	14:05 14:28
5946 (Samp. 16,14)				1	10/9/18	14:53 15:23
7053 (Samp 15,25,17)				1	10/10/18	08:07 08:47
7034 (Samp 16,26,21)				1	10/10/18	09:32 09:57
6615 (Samp 28,31,30)				1	10/10/18	10:20 10:37
7041 (Samp 32,29,33)				1	10/10/18	10:54 11:06
7057 (Samp 34,35,36)				1	10/10/18	11:37 11:50
7046 (Samp. 37,38)				1	10/10/18	12:04 12:20
Client's P.O. Number: _____						
Relinquished by: Print: <u>KEITH JOHNSON</u> Sign: <u>J. Johnson</u>	Received by: Company: TetraTech Print: <u>Keith Johnson</u> Sign: <u>J. Johnson</u>	** ABBREVIATIONS		Turnaround Time: (Check)		
Relinquished by: Print: _____ Sign: _____	Received by: Company: _____ Print: _____ Sign: _____	A-Air AQ-Aqueous C-Composite DW-Drinking Water W-Water G-Grab		Same day _____ 24 hours _____ 48 hours _____ Intact _____	72 hours _____ 5 days _____ Normal _____ Temperature _____	

Note: Payment for service is due within 30 days from the date of invoice.  
Samples will be disposed of after 30 days from the date of issuing the final report.

White - Accompany Lab Report to Client  
Canary - Lab's Chrono File  
Pink - Client's Copy

## Appendix C

### Cinder Lake Annual Tonnage

APPENDIX C

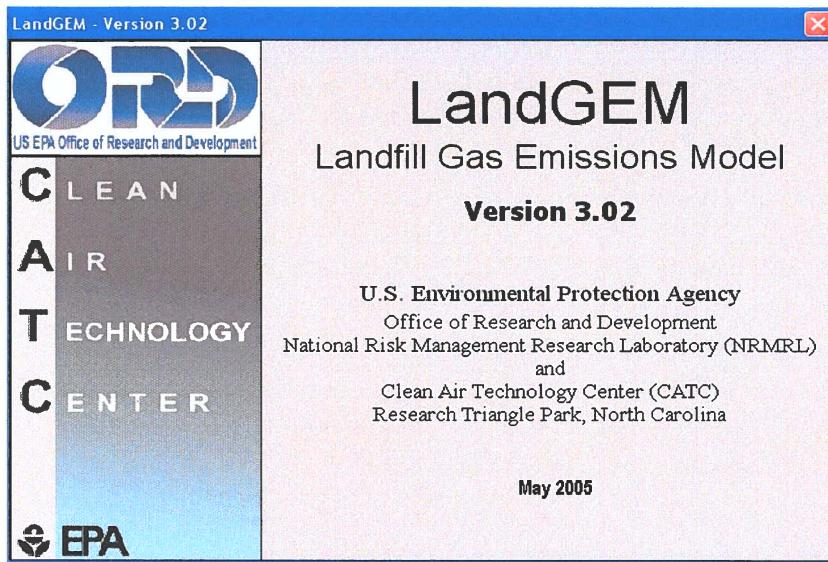
Cinder Lake Landfill Annual Tonnage		
Year	Accepted Tonnage	Waste in Place
1965	14,274	0
1966	17,359	14,274
1967	20,489	31,633
1968	23,666	52,122
1969	26,892	75,788
1970	30,168	102,680
1971	33,182	132,848
1972	36,230	166,030
1973	39,313	202,260
1974	42,432	241,573
1975	45,587	284,005
1976	51,826	329,592
1977	58,103	381,418
1978	64,420	439,521
1979	70,779	503,941
1980	77,206	574,720
1981	83,608	651,926
1982	90,052	735,534
1983	96,540	825,586
1984	103,073	922,126
1985	112,207	1,025,199
1986	147,549	1,137,406
1987	112,400	1,284,955
1988	116,438	1,397,355
1989	117,714	1,513,793
1990	127,629	1,631,507
1991	149,000	1,759,136
1992	170,948	1,908,136
1993	75,915	2,079,084
1994	125,644	2,154,999
1995	119,112	2,280,643
1996	149,232	2,399,755
1997	132,253	2,548,987
1998	139,477	2,681,240
1999	140,501	2,820,717
2000	117,597	2,961,218
2001	109,835	3,078,815
2002	126,650	3,188,650
2003	117,880	3,315,300
2004	134,367	3,433,180
2005	151,188	3,567,547
2006	130,851	3,718,735
2007	140,430	3,849,586

2008	132,340	3,990,016
2009	117,520	4,122,356
2010	116,448	4,239,876
2011	105,208	4,356,324
2012	108,806	4,461,532
2013	99,780	4,570,338
2014	104,191	4,670,118
2015	104,508	4,774,309
2016	104,325	4,878,817
2017	107,455	4,983,142
2018	110,678	5,090,597
2019	113,999	5,201,275
2020	117,419	5,315,274
2021	120,941	5,432,693
2022	124,570	5,553,634
2023	128,307	5,678,204
2024	132,156	5,806,511
2025	136,120	5,938,667
2026	140,204	6,074,787
2027	144,410	6,214,991
2028	148,743	6,359,401
2029	153,205	6,508,144
2030	157,801	6,661,349
2031	162,535	6,819,150
2032	167,411	6,981,685
2033	172,433	7,149,096
2034	177,606	7,321,529
2035	182,935	7,499,135
2036	188,423	7,682,070
2037	194,075	7,870,493
2038	199,897	8,064,568
2039	205,894	8,264,465
2040	212,071	8,470,359
2041	218,433	8,682,430
2042	224,986	8,900,863
2043	231,736	9,125,849
2044	238,688	9,357,585

Note: Tonnage Accepted provided by the City of Flagstaff

## Appendix D

# LandGEM Modeling Input and Results



## Summary Report

**Landfill Name or Identifier:** Cinder Lake Landfill

**Date:** Tuesday, October 30, 2018

**Description/Comments:**

Tier 2 analysis using site-specific NMOC concentrations.

**About LandGEM:**

$$\text{First-Order Decomposition Rate Equation: } Q_{CH_4} = \sum_{i=1}^n \sum_{j=0.1}^1 k L_o \left( \frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

$Q_{CH_4}$  = annual methane generation in the year of the calculation ( $m^3/\text{year}$ )

$i$  = 1-year time increment

$n$  = (year of the calculation) - (initial year of waste acceptance)

$j$  = 0.1-year time increment

$k$  = methane generation rate ( $\text{year}^{-1}$ )

$L_o$  = potential methane generation capacity ( $m^3/Mg$ )

$M_i$  = mass of waste accepted in the  $i^{\text{th}}$  year ( $Mg$ )

$t_{ij}$  = age of the  $j^{\text{th}}$  section of waste mass  $M_i$  accepted in the  $i^{\text{th}}$  year  
(decimal years, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at <http://www.epa.gov/ttnatw01/landfill/landflpg.html>.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for conventional landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

## Input Review

### LANDFILL CHARACTERISTICS

Landfill Open Year	<b>1965</b>
Landfill Closure Year (with 80-year limit)	<b>2044</b>
<i>Actual Closure Year (without limit)</i>	<b>2044</b>
Have Model Calculate Closure Year?	No
Waste Design Capacity	<i>short tons</i>

### MODEL PARAMETERS

Methane Generation Rate, k	<b>0.020</b>	<i>year<sup>-1</sup></i>
Potential Methane Generation Capacity, L <sub>o</sub>	<b>170</b>	<i>m<sup>3</sup>/Mg</i>
NMOC Concentration	<b>259</b>	<i>ppmv as hexane</i>
Methane Content	<b>50</b>	<i>% by volume</i>

### GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	<b>Total landfill gas</b>
Gas / Pollutant #2:	<b>Methane</b>
Gas / Pollutant #3:	<b>Total Reduced Sulfur Compounds</b>
Gas / Pollutant #4:	<b>NMOC</b>

### WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
1965	12,976	14,274	0	0
1966	15,781	17,359	12,976	14,274
1967	18,626	20,489	28,757	31,633
1968	21,515	23,666	47,384	52,122
1969	24,447	26,892	68,898	75,788
1970	27,425	30,168	93,345	102,680
1971	30,165	33,182	120,771	132,848
1972	32,936	36,230	150,936	166,030
1973	35,739	39,313	183,873	202,260
1974	38,575	42,432	219,612	241,573
1975	41,443	45,587	258,186	284,005
1976	47,115	51,826	299,629	329,592
1977	52,821	58,103	346,744	381,418
1978	58,564	64,420	399,565	439,521
1979	64,345	70,779	458,128	503,941
1980	70,187	77,206	522,473	574,720
1981	76,007	83,608	592,660	651,926
1982	81,865	90,052	668,667	735,534
1983	87,764	96,540	750,533	825,586
1984	93,703	103,073	838,296	922,126
1985	102,006	112,207	931,999	1,025,199
1986	134,135	147,549	1,034,005	1,137,406
1987	102,182	112,400	1,168,141	1,284,955
1988	105,853	116,438	1,270,323	1,397,355
1989	107,013	117,714	1,376,175	1,513,793
1990	116,026	127,629	1,483,188	1,631,507
1991	135,455	149,000	1,599,215	1,759,136
1992	155,407	170,948	1,734,669	1,908,136
1993	69,014	75,915	1,890,076	2,079,084
1994	114,222	125,644	1,959,090	2,154,999
1995	108,284	119,112	2,073,312	2,280,643
1996	135,665	149,232	2,181,595	2,399,755
1997	120,230	132,253	2,317,261	2,548,987
1998	126,797	139,477	2,437,491	2,681,240
1999	127,728	140,501	2,564,288	2,820,717
2000	106,906	117,597	2,692,016	2,961,218
2001	99,850	109,835	2,798,923	3,078,815
2002	115,136	126,650	2,898,773	3,188,650
2003	107,164	117,880	3,013,909	3,315,300
2004	122,152	134,367	3,121,073	3,433,180

WASTE ACCEPTANCE RATES (Continued)

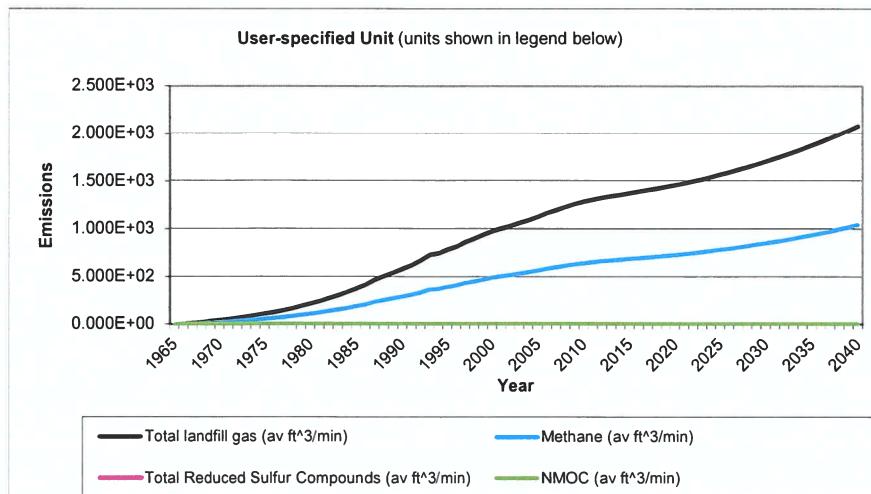
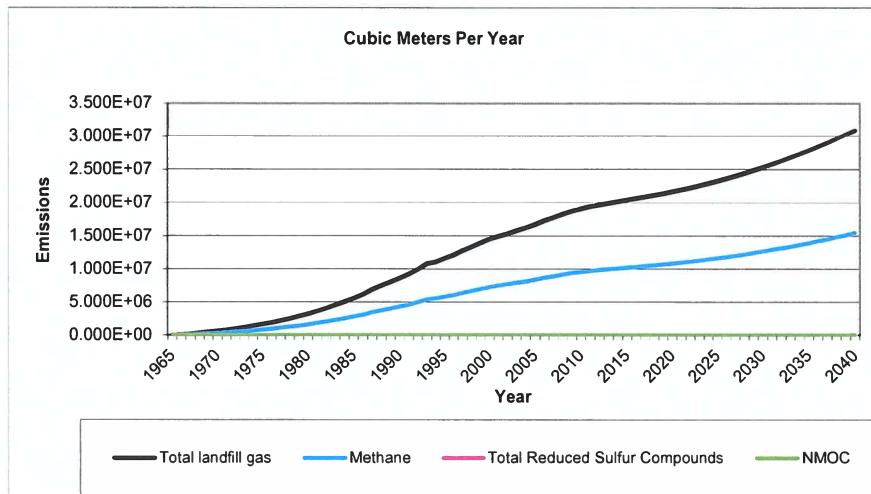
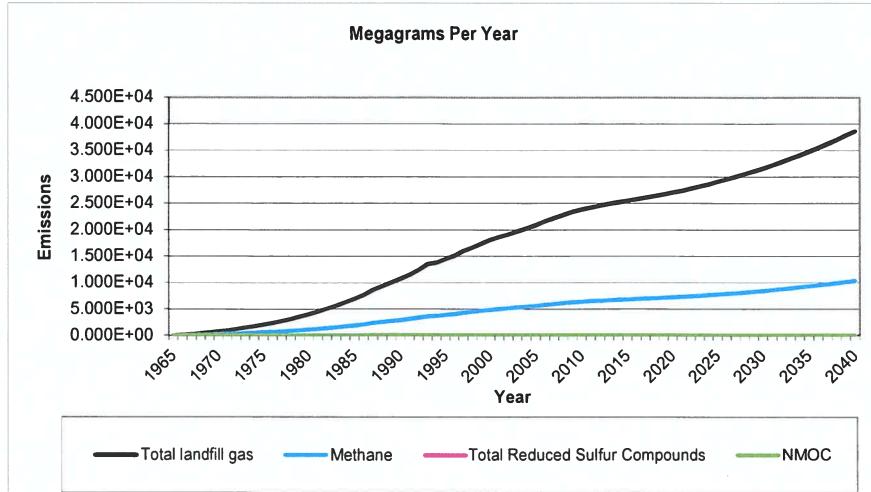
Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2005	137,444	151,188	3,243,225	3,567,547
2006	118,955	130,851	3,380,668	3,718,735
2007	127,664	140,430	3,499,624	3,849,586
2008	120,309	132,340	3,627,287	3,990,016
2009	106,836	117,520	3,747,596	4,122,356
2010	105,862	116,448	3,854,433	4,239,876
2011	95,644	105,208	3,960,295	4,356,324
2012	98,915	108,806	4,055,938	4,461,532
2013	90,709	99,780	4,154,853	4,570,338
2014	94,719	104,191	4,245,562	4,670,118
2015	95,007	104,508	4,340,281	4,774,309
2016	94,841	104,325	4,435,288	4,878,817
2017	97,686	107,455	4,530,129	4,983,142
2018	100,616	110,678	4,627,815	5,090,597
2019	103,635	113,999	4,728,432	5,201,275
2020	106,745	117,419	4,832,067	5,315,274
2021	109,946	120,941	4,938,812	5,432,693
2022	113,245	124,570	5,048,758	5,553,634
2023	116,643	128,307	5,162,004	5,678,204
2024	120,142	132,156	5,278,646	5,806,511
2025	123,745	136,120	5,398,788	5,938,667
2026	127,458	140,204	5,522,534	6,074,787
2027	131,282	144,410	5,649,992	6,214,991
2028	135,221	148,743	5,781,274	6,359,401
2029	139,277	153,205	5,916,495	6,508,144
2030	143,455	157,801	6,055,772	6,661,349
2031	147,759	162,535	6,199,227	6,819,150
2032	152,192	167,411	6,346,986	6,981,685
2033	156,757	172,433	6,499,178	7,149,096
2034	161,460	177,606	6,655,935	7,321,529
2035	166,305	182,935	6,817,395	7,499,135
2036	171,294	188,423	6,983,700	7,682,070
2037	176,432	194,075	7,154,994	7,870,493
2038	181,725	199,897	7,331,425	8,064,568
2039	187,176	205,894	7,513,150	8,264,465
2040	192,792	212,071	7,700,326	8,470,359
2041	198,575	218,433	7,893,118	8,682,430
2042	204,533	224,986	8,091,694	8,900,863
2043	210,669	231,736	8,296,226	9,125,849
2044	216,989	238,688	8,506,895	9,357,585

## Pollutant Parameters

Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)
Gases	Total landfill gas		0.00	
	Methane		16.04	
	Carbon dioxide		44.01	
	NMOC	4,000	86.18	
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41	
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85	
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97	
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94	
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96	
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99	
	2-Propanol (isopropyl alcohol) - VOC	50	60.11	
	Acetone	7.0	58.08	
	Acrylonitrile - HAP/VOC	6.3	53.06	
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11	
	Benzene - Co-disposal - HAP/VOC	11	78.11	
	Bromodichloromethane - VOC	3.1	163.83	
	Butane - VOC	5.0	58.12	
	Carbon disulfide - HAP/VOC	0.58	76.13	
	Carbon monoxide	140	28.01	
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84	
	Carbonyl sulfide - HAP/VOC	0.49	60.07	
	Chlorobenzene - HAP/VOC	0.25	112.56	
	Chlorodifluoromethane	1.3	86.47	
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52	
	Chloroform - HAP/VOC	0.03	119.39	
	Chloromethane - VOC	1.2	50.49	
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147	
	Dichlorodifluoromethane	16	120.91	
	Dichlorofluoromethane - VOC	2.6	102.92	
	Dichloromethane (methylene chloride) - HAP	14	84.94	
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13	
	Ethane	890	30.07	
	Ethanol - VOC	27	46.08	

## **Pollutant Parameters (Continued)**

## Graphs



## Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
1965	0	0	0	0	0	0
1966	1.092E+02	8.745E+04	5.876E+00	2.917E+01	4.373E+04	2.938E+00
1967	2.399E+02	1.921E+05	1.291E+01	6.407E+01	9.603E+04	6.453E+00
1968	3.919E+02	3.138E+05	2.108E+01	1.047E+02	1.569E+05	1.054E+01
1969	5.652E+02	4.526E+05	3.041E+01	1.510E+02	2.263E+05	1.520E+01
1970	7.597E+02	6.084E+05	4.088E+01	2.029E+02	3.042E+05	2.044E+01
1971	9.755E+02	7.811E+05	5.248E+01	2.606E+02	3.906E+05	2.624E+01
1972	1.210E+03	9.690E+05	6.510E+01	3.232E+02	4.845E+05	3.255E+01
1973	1.463E+03	1.172E+06	7.873E+01	3.909E+02	5.859E+05	3.936E+01
1974	1.735E+03	1.389E+06	9.335E+01	4.635E+02	6.947E+05	4.668E+01
1975	2.025E+03	1.622E+06	1.090E+02	5.410E+02	8.109E+05	5.449E+01
1976	2.334E+03	1.869E+06	1.256E+02	6.235E+02	9.345E+05	6.279E+01
1977	2.684E+03	2.150E+06	1.444E+02	7.170E+02	1.075E+06	7.221E+01
1978	3.076E+03	2.463E+06	1.655E+02	8.216E+02	1.231E+06	8.274E+01
1979	3.508E+03	2.809E+06	1.887E+02	9.370E+02	1.404E+06	9.436E+01
1980	3.980E+03	3.187E+06	2.141E+02	1.063E+03	1.593E+06	1.071E+02
1981	4.492E+03	3.597E+06	2.417E+02	1.200E+03	1.798E+06	1.208E+02
1982	5.042E+03	4.038E+06	2.713E+02	1.347E+03	2.019E+06	1.356E+02
1983	5.632E+03	4.510E+06	3.030E+02	1.504E+03	2.255E+06	1.515E+02
1984	6.259E+03	5.012E+06	3.367E+02	1.672E+03	2.506E+06	1.684E+02
1985	6.923E+03	5.544E+06	3.725E+02	1.849E+03	2.772E+06	1.862E+02
1986	7.645E+03	6.122E+06	4.113E+02	2.042E+03	3.061E+06	2.057E+02
1987	8.622E+03	6.904E+06	4.639E+02	2.303E+03	3.452E+06	2.320E+02
1988	9.312E+03	7.456E+06	5.010E+02	2.487E+03	3.728E+06	2.505E+02
1989	1.002E+04	8.022E+06	5.390E+02	2.676E+03	4.011E+06	2.695E+02
1990	1.072E+04	8.584E+06	5.768E+02	2.863E+03	4.292E+06	2.884E+02
1991	1.148E+04	9.196E+06	6.179E+02	3.068E+03	4.598E+06	3.089E+02
1992	1.240E+04	9.927E+06	6.670E+02	3.311E+03	4.963E+06	3.335E+02
1993	1.346E+04	1.078E+07	7.242E+02	3.595E+03	5.389E+06	3.621E+02
1994	1.377E+04	1.103E+07	7.411E+02	3.679E+03	5.515E+06	3.705E+02
1995	1.446E+04	1.158E+07	7.781E+02	3.863E+03	5.790E+06	3.891E+02
1996	1.509E+04	1.208E+07	8.117E+02	4.030E+03	6.041E+06	4.059E+02
1997	1.593E+04	1.276E+07	8.571E+02	4.255E+03	6.378E+06	4.285E+02
1998	1.663E+04	1.331E+07	8.946E+02	4.441E+03	6.657E+06	4.473E+02
1999	1.736E+04	1.390E+07	9.343E+02	4.638E+03	6.952E+06	4.671E+02
2000	1.810E+04	1.449E+07	9.736E+02	4.834E+03	7.245E+06	4.868E+02
2001	1.864E+04	1.492E+07	1.003E+03	4.978E+03	7.462E+06	5.014E+02
2002	1.911E+04	1.530E+07	1.028E+03	5.104E+03	7.651E+06	5.140E+02
2003	1.970E+04	1.577E+07	1.060E+03	5.262E+03	7.887E+06	5.299E+02
2004	2.021E+04	1.618E+07	1.087E+03	5.399E+03	8.092E+06	5.437E+02
2005	2.084E+04	1.669E+07	1.121E+03	5.566E+03	8.343E+06	5.606E+02
2006	2.158E+04	1.728E+07	1.161E+03	5.765E+03	8.641E+06	5.806E+02
2007	2.216E+04	1.774E+07	1.192E+03	5.918E+03	8.871E+06	5.960E+02
2008	2.279E+04	1.825E+07	1.226E+03	6.088E+03	9.126E+06	6.131E+02
2009	2.335E+04	1.870E+07	1.256E+03	6.238E+03	9.350E+06	6.282E+02
2010	2.379E+04	1.905E+07	1.280E+03	6.355E+03	9.525E+06	6.400E+02
2011	2.421E+04	1.939E+07	1.303E+03	6.467E+03	9.693E+06	6.513E+02
2012	2.454E+04	1.965E+07	1.320E+03	6.554E+03	9.824E+06	6.600E+02
2013	2.488E+04	1.992E+07	1.339E+03	6.646E+03	9.962E+06	6.694E+02
2014	2.515E+04	2.014E+07	1.353E+03	6.719E+03	1.007E+07	6.766E+02

## Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2015	2.545E+04	2.038E+07	1.369E+03	6.799E+03	1.019E+07	6.847E+02
2016	2.575E+04	2.062E+07	1.385E+03	6.877E+03	1.031E+07	6.926E+02
2017	2.604E+04	2.085E+07	1.401E+03	6.955E+03	1.042E+07	7.004E+02
2018	2.634E+04	2.109E+07	1.417E+03	7.036E+03	1.055E+07	7.086E+02
2019	2.667E+04	2.135E+07	1.435E+03	7.123E+03	1.068E+07	7.174E+02
2020	2.701E+04	2.163E+07	1.453E+03	7.215E+03	1.081E+07	7.267E+02
2021	2.738E+04	2.192E+07	1.473E+03	7.312E+03	1.096E+07	7.364E+02
2022	2.776E+04	2.223E+07	1.493E+03	7.415E+03	1.111E+07	7.467E+02
2023	2.816E+04	2.255E+07	1.515E+03	7.522E+03	1.128E+07	7.576E+02
2024	2.859E+04	2.289E+07	1.538E+03	7.636E+03	1.145E+07	7.690E+02
2025	2.903E+04	2.325E+07	1.562E+03	7.755E+03	1.162E+07	7.810E+02
2026	2.950E+04	2.362E+07	1.587E+03	7.879E+03	1.181E+07	7.935E+02
2027	2.999E+04	2.401E+07	1.613E+03	8.010E+03	1.201E+07	8.067E+02
2028	3.050E+04	2.442E+07	1.641E+03	8.146E+03	1.221E+07	8.204E+02
2029	3.103E+04	2.485E+07	1.670E+03	8.289E+03	1.242E+07	8.348E+02
2030	3.159E+04	2.530E+07	1.700E+03	8.438E+03	1.265E+07	8.498E+02
2031	3.217E+04	2.576E+07	1.731E+03	8.593E+03	1.288E+07	8.654E+02
2032	3.278E+04	2.625E+07	1.764E+03	8.755E+03	1.312E+07	8.818E+02
2033	3.341E+04	2.675E+07	1.798E+03	8.924E+03	1.338E+07	8.988E+02
2034	3.407E+04	2.728E+07	1.833E+03	9.100E+03	1.364E+07	9.165E+02
2035	3.475E+04	2.783E+07	1.870E+03	9.282E+03	1.391E+07	9.349E+02
2036	3.546E+04	2.840E+07	1.908E+03	9.473E+03	1.420E+07	9.540E+02
2037	3.620E+04	2.899E+07	1.948E+03	9.670E+03	1.449E+07	9.739E+02
2038	3.697E+04	2.960E+07	1.989E+03	9.875E+03	1.480E+07	9.946E+02
2039	3.777E+04	3.024E+07	2.032E+03	1.009E+04	1.512E+07	1.016E+03
2040	3.860E+04	3.091E+07	2.077E+03	1.031E+04	1.545E+07	1.038E+03
2041	3.945E+04	3.159E+07	2.123E+03	1.054E+04	1.580E+07	1.061E+03
2042	4.034E+04	3.231E+07	2.171E+03	1.078E+04	1.615E+07	1.085E+03
2043	4.127E+04	3.304E+07	2.220E+03	1.102E+04	1.652E+07	1.110E+03
2044	4.222E+04	3.381E+07	2.272E+03	1.128E+04	1.690E+07	1.136E+03
2045	4.321E+04	3.460E+07	2.325E+03	1.154E+04	1.730E+07	1.162E+03
2046	4.236E+04	3.392E+07	2.279E+03	1.131E+04	1.696E+07	1.139E+03
2047	4.152E+04	3.325E+07	2.234E+03	1.109E+04	1.662E+07	1.117E+03
2048	4.070E+04	3.259E+07	2.190E+03	1.087E+04	1.629E+07	1.095E+03
2049	3.989E+04	3.194E+07	2.146E+03	1.065E+04	1.597E+07	1.073E+03
2050	3.910E+04	3.131E+07	2.104E+03	1.044E+04	1.565E+07	1.052E+03
2051	3.833E+04	3.069E+07	2.062E+03	1.024E+04	1.534E+07	1.031E+03
2052	3.757E+04	3.008E+07	2.021E+03	1.003E+04	1.504E+07	1.011E+03
2053	3.682E+04	2.949E+07	1.981E+03	9.836E+03	1.474E+07	9.906E+02
2054	3.609E+04	2.890E+07	1.942E+03	9.641E+03	1.445E+07	9.710E+02
2055	3.538E+04	2.833E+07	1.903E+03	9.450E+03	1.416E+07	9.517E+02
2056	3.468E+04	2.777E+07	1.866E+03	9.263E+03	1.388E+07	9.329E+02
2057	3.399E+04	2.722E+07	1.829E+03	9.080E+03	1.361E+07	9.144E+02
2058	3.332E+04	2.668E+07	1.793E+03	8.900E+03	1.334E+07	8.963E+02
2059	3.266E+04	2.615E+07	1.757E+03	8.724E+03	1.308E+07	8.786E+02
2060	3.201E+04	2.563E+07	1.722E+03	8.551E+03	1.282E+07	8.612E+02
2061	3.138E+04	2.513E+07	1.688E+03	8.381E+03	1.256E+07	8.441E+02
2062	3.076E+04	2.463E+07	1.655E+03	8.216E+03	1.231E+07	8.274E+02
2063	3.015E+04	2.414E+07	1.622E+03	8.053E+03	1.207E+07	8.110E+02
2064	2.955E+04	2.366E+07	1.590E+03	7.893E+03	1.183E+07	7.950E+02
2065	2.897E+04	2.319E+07	1.558E+03	7.737E+03	1.160E+07	7.792E+02

## Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2066	2.839E+04	2.274E+07	1.528E+03	7.584E+03	1.137E+07	7.638E+02
2067	2.783E+04	2.229E+07	1.497E+03	7.434E+03	1.114E+07	7.487E+02
2068	2.728E+04	2.184E+07	1.468E+03	7.287E+03	1.092E+07	7.338E+02
2069	2.674E+04	2.141E+07	1.439E+03	7.142E+03	1.071E+07	7.193E+02
2070	2.621E+04	2.099E+07	1.410E+03	7.001E+03	1.049E+07	7.051E+02
2071	2.569E+04	2.057E+07	1.382E+03	6.862E+03	1.029E+07	6.911E+02
2072	2.518E+04	2.016E+07	1.355E+03	6.726E+03	1.008E+07	6.774E+02
2073	2.468E+04	1.977E+07	1.328E+03	6.593E+03	9.883E+06	6.640E+02
2074	2.419E+04	1.937E+07	1.302E+03	6.463E+03	9.687E+06	6.509E+02
2075	2.372E+04	1.899E+07	1.276E+03	6.335E+03	9.495E+06	6.380E+02
2076	2.325E+04	1.861E+07	1.251E+03	6.209E+03	9.307E+06	6.253E+02
2077	2.279E+04	1.825E+07	1.226E+03	6.086E+03	9.123E+06	6.130E+02
2078	2.233E+04	1.788E+07	1.202E+03	5.966E+03	8.942E+06	6.008E+02
2079	2.189E+04	1.753E+07	1.178E+03	5.848E+03	8.765E+06	5.889E+02
2080	2.146E+04	1.718E+07	1.155E+03	5.732E+03	8.591E+06	5.773E+02
2081	2.103E+04	1.684E+07	1.132E+03	5.618E+03	8.421E+06	5.658E+02
2082	2.062E+04	1.651E+07	1.109E+03	5.507E+03	8.255E+06	5.546E+02
2083	2.021E+04	1.618E+07	1.087E+03	5.398E+03	8.091E+06	5.436E+02
2084	1.981E+04	1.586E+07	1.066E+03	5.291E+03	7.931E+06	5.329E+02
2085	1.942E+04	1.555E+07	1.045E+03	5.186E+03	7.774E+06	5.223E+02
2086	1.903E+04	1.524E+07	1.024E+03	5.084E+03	7.620E+06	5.120E+02
2087	1.866E+04	1.494E+07	1.004E+03	4.983E+03	7.469E+06	5.018E+02
2088	1.829E+04	1.464E+07	9.838E+02	4.884E+03	7.321E+06	4.919E+02
2089	1.792E+04	1.435E+07	9.643E+02	4.788E+03	7.176E+06	4.822E+02
2090	1.757E+04	1.407E+07	9.452E+02	4.693E+03	7.034E+06	4.726E+02
2091	1.722E+04	1.379E+07	9.265E+02	4.600E+03	6.895E+06	4.633E+02
2092	1.688E+04	1.352E+07	9.082E+02	4.509E+03	6.758E+06	4.541E+02
2093	1.655E+04	1.325E+07	8.902E+02	4.419E+03	6.624E+06	4.451E+02
2094	1.622E+04	1.299E+07	8.726E+02	4.332E+03	6.493E+06	4.363E+02
2095	1.590E+04	1.273E+07	8.553E+02	4.246E+03	6.365E+06	4.276E+02
2096	1.558E+04	1.248E+07	8.384E+02	4.162E+03	6.239E+06	4.192E+02
2097	1.527E+04	1.223E+07	8.218E+02	4.080E+03	6.115E+06	4.109E+02
2098	1.497E+04	1.199E+07	8.055E+02	3.999E+03	5.994E+06	4.027E+02
2099	1.467E+04	1.175E+07	7.895E+02	3.920E+03	5.875E+06	3.948E+02
2100	1.438E+04	1.152E+07	7.739E+02	3.842E+03	5.759E+06	3.869E+02
2101	1.410E+04	1.129E+07	7.586E+02	3.766E+03	5.645E+06	3.793E+02
2102	1.382E+04	1.107E+07	7.436E+02	3.691E+03	5.533E+06	3.718E+02
2103	1.355E+04	1.085E+07	7.288E+02	3.618E+03	5.424E+06	3.644E+02
2104	1.328E+04	1.063E+07	7.144E+02	3.547E+03	5.316E+06	3.572E+02
2105	1.302E+04	1.042E+07	7.003E+02	3.477E+03	5.211E+06	3.501E+02

## Results (Continued)

Year	Total Reduced Sulfur Compounds			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
1965	0	0	0	0	0	0
1966	1.039E-02	7.794E+00	5.237E-04	8.119E-02	2.265E+01	1.522E-03
1967	2.283E-02	1.712E+01	1.150E-03	1.783E-01	4.975E+01	3.342E-03
1968	3.730E-02	2.797E+01	1.879E-03	2.913E-01	8.127E+01	5.461E-03
1969	5.380E-02	4.034E+01	2.710E-03	4.202E-01	1.172E+02	7.876E-03
1970	7.231E-02	5.422E+01	3.643E-03	5.648E-01	1.576E+02	1.059E-02
1971	9.285E-02	6.962E+01	4.678E-03	7.252E-01	2.023E+02	1.359E-02
1972	1.152E-01	8.636E+01	5.803E-03	8.996E-01	2.510E+02	1.686E-02
1973	1.393E-01	1.044E+02	7.017E-03	1.088E+00	3.035E+02	2.039E-02
1974	1.652E-01	1.238E+02	8.321E-03	1.290E+00	3.599E+02	2.418E-02
1975	1.928E-01	1.446E+02	9.713E-03	1.506E+00	4.201E+02	2.822E-02
1976	2.222E-01	1.666E+02	1.119E-02	1.735E+00	4.841E+02	3.252E-02
1977	2.555E-01	1.916E+02	1.287E-02	1.996E+00	5.567E+02	3.741E-02
1978	2.928E-01	2.195E+02	1.475E-02	2.287E+00	6.379E+02	4.286E-02
1979	3.339E-01	2.504E+02	1.682E-02	2.608E+00	7.275E+02	4.888E-02
1980	3.788E-01	2.840E+02	1.908E-02	2.959E+00	8.254E+02	5.546E-02
1981	4.275E-01	3.206E+02	2.154E-02	3.339E+00	9.316E+02	6.259E-02
1982	4.800E-01	3.599E+02	2.418E-02	3.749E+00	1.046E+03	7.027E-02
1983	5.360E-01	4.019E+02	2.701E-02	4.187E+00	1.168E+03	7.848E-02
1984	5.957E-01	4.467E+02	3.001E-02	4.653E+00	1.298E+03	8.721E-02
1985	6.590E-01	4.941E+02	3.320E-02	5.147E+00	1.436E+03	9.648E-02
1986	7.276E-01	5.456E+02	3.666E-02	5.683E+00	1.585E+03	1.065E-01
1987	8.207E-01	6.154E+02	4.135E-02	6.410E+00	1.788E+03	1.202E-01
1988	8.863E-01	6.646E+02	4.465E-02	6.922E+00	1.931E+03	1.298E-01
1989	9.535E-01	7.150E+02	4.804E-02	7.447E+00	2.078E+03	1.396E-01
1990	1.020E+00	7.651E+02	5.141E-02	7.969E+00	2.223E+03	1.494E-01
1991	1.093E+00	8.197E+02	5.507E-02	8.538E+00	2.382E+03	1.600E-01
1992	1.180E+00	8.848E+02	5.945E-02	9.216E+00	2.571E+03	1.728E-01
1993	1.281E+00	9.606E+02	6.454E-02	1.001E+01	2.791E+03	1.876E-01
1994	1.311E+00	9.831E+02	6.605E-02	1.024E+01	2.857E+03	1.919E-01
1995	1.377E+00	1.032E+03	6.935E-02	1.075E+01	2.999E+03	2.015E-01
1996	1.436E+00	1.077E+03	7.235E-02	1.122E+01	3.129E+03	2.102E-01
1997	1.516E+00	1.137E+03	7.639E-02	1.184E+01	3.304E+03	2.220E-01
1998	1.583E+00	1.187E+03	7.973E-02	1.236E+01	3.448E+03	2.317E-01
1999	1.653E+00	1.239E+03	8.327E-02	1.291E+01	3.601E+03	2.420E-01
2000	1.722E+00	1.292E+03	8.678E-02	1.345E+01	3.753E+03	2.522E-01
2001	1.774E+00	1.330E+03	8.937E-02	1.385E+01	3.865E+03	2.597E-01
2002	1.819E+00	1.364E+03	9.163E-02	1.421E+01	3.963E+03	2.663E-01
2003	1.875E+00	1.406E+03	9.447E-02	1.464E+01	4.085E+03	2.745E-01
2004	1.924E+00	1.442E+03	9.692E-02	1.502E+01	4.192E+03	2.816E-01
2005	1.983E+00	1.487E+03	9.993E-02	1.549E+01	4.322E+03	2.904E-01
2006	2.054E+00	1.540E+03	1.035E-01	1.604E+01	4.476E+03	3.008E-01
2007	2.109E+00	1.581E+03	1.063E-01	1.647E+01	4.595E+03	3.087E-01
2008	2.169E+00	1.627E+03	1.093E-01	1.694E+01	4.727E+03	3.176E-01
2009	2.223E+00	1.667E+03	1.120E-01	1.736E+01	4.843E+03	3.254E-01
2010	2.264E+00	1.698E+03	1.141E-01	1.769E+01	4.934E+03	3.315E-01
2011	2.304E+00	1.728E+03	1.161E-01	1.800E+01	5.021E+03	3.374E-01
2012	2.335E+00	1.751E+03	1.177E-01	1.824E+01	5.089E+03	3.419E-01
2013	2.368E+00	1.776E+03	1.193E-01	1.850E+01	5.160E+03	3.467E-01
2014	2.394E+00	1.795E+03	1.206E-01	1.870E+01	5.217E+03	3.505E-01

## Results (Continued)

Year	Total Reduced Sulfur Compounds			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2015	2.423E+00	1.817E+03	1.221E-01	1.892E+01	5.279E+03	3.547E-01
2016	2.451E+00	1.838E+03	1.235E-01	1.914E+01	5.340E+03	3.588E-01
2017	2.478E+00	1.858E+03	1.249E-01	1.936E+01	5.400E+03	3.628E-01
2018	2.507E+00	1.880E+03	1.263E-01	1.958E+01	5.463E+03	3.671E-01
2019	2.538E+00	1.903E+03	1.279E-01	1.982E+01	5.531E+03	3.716E-01
2020	2.571E+00	1.928E+03	1.295E-01	2.008E+01	5.602E+03	3.764E-01
2021	2.606E+00	1.954E+03	1.313E-01	2.035E+01	5.678E+03	3.815E-01
2022	2.642E+00	1.981E+03	1.331E-01	2.064E+01	5.757E+03	3.868E-01
2023	2.681E+00	2.010E+03	1.350E-01	2.094E+01	5.841E+03	3.924E-01
2024	2.721E+00	2.040E+03	1.371E-01	2.125E+01	5.929E+03	3.983E-01
2025	2.763E+00	2.072E+03	1.392E-01	2.158E+01	6.021E+03	4.045E-01
2026	2.808E+00	2.105E+03	1.415E-01	2.193E+01	6.118E+03	4.110E-01
2027	2.854E+00	2.140E+03	1.438E-01	2.229E+01	6.219E+03	4.179E-01
2028	2.903E+00	2.177E+03	1.462E-01	2.267E+01	6.325E+03	4.250E-01
2029	2.954E+00	2.215E+03	1.488E-01	2.307E+01	6.436E+03	4.324E-01
2030	3.007E+00	2.255E+03	1.515E-01	2.348E+01	6.551E+03	4.402E-01
2031	3.062E+00	2.296E+03	1.543E-01	2.392E+01	6.672E+03	4.483E-01
2032	3.120E+00	2.339E+03	1.572E-01	2.437E+01	6.798E+03	4.568E-01
2033	3.180E+00	2.384E+03	1.602E-01	2.484E+01	6.929E+03	4.656E-01
2034	3.243E+00	2.431E+03	1.634E-01	2.533E+01	7.065E+03	4.747E-01
2035	3.308E+00	2.480E+03	1.666E-01	2.583E+01	7.207E+03	4.843E-01
2036	3.375E+00	2.531E+03	1.701E-01	2.636E+01	7.355E+03	4.942E-01
2037	3.446E+00	2.584E+03	1.736E-01	2.691E+01	7.508E+03	5.045E-01
2038	3.519E+00	2.639E+03	1.773E-01	2.748E+01	7.667E+03	5.152E-01
2039	3.595E+00	2.696E+03	1.811E-01	2.808E+01	7.833E+03	5.263E-01
2040	3.674E+00	2.755E+03	1.851E-01	2.869E+01	8.004E+03	5.378E-01
2041	3.755E+00	2.816E+03	1.892E-01	2.933E+01	8.182E+03	5.498E-01
2042	3.840E+00	2.879E+03	1.935E-01	2.999E+01	8.367E+03	5.622E-01
2043	3.928E+00	2.945E+03	1.979E-01	3.068E+01	8.558E+03	5.750E-01
2044	4.019E+00	3.013E+03	2.025E-01	3.139E+01	8.757E+03	5.884E-01
2045	4.113E+00	3.084E+03	2.072E-01	3.212E+01	8.962E+03	6.022E-01
2046	4.032E+00	3.023E+03	2.031E-01	3.149E+01	8.785E+03	5.902E-01
2047	3.952E+00	2.963E+03	1.991E-01	3.086E+01	8.611E+03	5.785E-01
2048	3.874E+00	2.904E+03	1.952E-01	3.025E+01	8.440E+03	5.671E-01
2049	3.797E+00	2.847E+03	1.913E-01	2.965E+01	8.273E+03	5.559E-01
2050	3.722E+00	2.791E+03	1.875E-01	2.907E+01	8.109E+03	5.449E-01
2051	3.648E+00	2.735E+03	1.838E-01	2.849E+01	7.949E+03	5.341E-01
2052	3.576E+00	2.681E+03	1.801E-01	2.793E+01	7.791E+03	5.235E-01
2053	3.505E+00	2.628E+03	1.766E-01	2.737E+01	7.637E+03	5.131E-01
2054	3.435E+00	2.576E+03	1.731E-01	2.683E+01	7.486E+03	5.030E-01
2055	3.367E+00	2.525E+03	1.697E-01	2.630E+01	7.337E+03	4.930E-01
2056	3.301E+00	2.475E+03	1.663E-01	2.578E+01	7.192E+03	4.832E-01
2057	3.235E+00	2.426E+03	1.630E-01	2.527E+01	7.050E+03	4.737E-01
2058	3.171E+00	2.378E+03	1.598E-01	2.477E+01	6.910E+03	4.643E-01
2059	3.109E+00	2.331E+03	1.566E-01	2.428E+01	6.773E+03	4.551E-01
2060	3.047E+00	2.285E+03	1.535E-01	2.380E+01	6.639E+03	4.461E-01
2061	2.987E+00	2.240E+03	1.505E-01	2.333E+01	6.508E+03	4.373E-01
2062	2.928E+00	2.195E+03	1.475E-01	2.286E+01	6.379E+03	4.286E-01
2063	2.870E+00	2.152E+03	1.446E-01	2.241E+01	6.253E+03	4.201E-01
2064	2.813E+00	2.109E+03	1.417E-01	2.197E+01	6.129E+03	4.118E-01
2065	2.757E+00	2.067E+03	1.389E-01	2.153E+01	6.007E+03	4.036E-01

## Results (Continued)

Year	Total Reduced Sulfur Compounds			NMOC		
	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m <sup>3</sup> /year)	(av ft <sup>3</sup> /min)
2066	2.702E+00	2.026E+03	1.362E-01	2.111E+01	5.888E+03	3.956E-01
2067	2.649E+00	1.986E+03	1.335E-01	2.069E+01	5.772E+03	3.878E-01
2068	2.596E+00	1.947E+03	1.308E-01	2.028E+01	5.658E+03	3.801E-01
2069	2.545E+00	1.908E+03	1.282E-01	1.988E+01	5.546E+03	3.726E-01
2070	2.495E+00	1.871E+03	1.257E-01	1.948E+01	5.436E+03	3.652E-01
2071	2.445E+00	1.834E+03	1.232E-01	1.910E+01	5.328E+03	3.580E-01
2072	2.397E+00	1.797E+03	1.208E-01	1.872E+01	5.223E+03	3.509E-01
2073	2.349E+00	1.762E+03	1.184E-01	1.835E+01	5.119E+03	3.440E-01
2074	2.303E+00	1.727E+03	1.160E-01	1.799E+01	5.018E+03	3.371E-01
2075	2.257E+00	1.693E+03	1.137E-01	1.763E+01	4.918E+03	3.305E-01
2076	2.213E+00	1.659E+03	1.115E-01	1.728E+01	4.821E+03	3.239E-01
2077	2.169E+00	1.626E+03	1.093E-01	1.694E+01	4.726E+03	3.175E-01
2078	2.126E+00	1.594E+03	1.071E-01	1.660E+01	4.632E+03	3.112E-01
2079	2.084E+00	1.562E+03	1.050E-01	1.627E+01	4.540E+03	3.051E-01
2080	2.042E+00	1.532E+03	1.029E-01	1.595E+01	4.450E+03	2.990E-01
2081	2.002E+00	1.501E+03	1.009E-01	1.564E+01	4.362E+03	2.931E-01
2082	1.962E+00	1.471E+03	9.887E-02	1.533E+01	4.276E+03	2.873E-01
2083	1.924E+00	1.442E+03	9.691E-02	1.502E+01	4.191E+03	2.816E-01
2084	1.885E+00	1.414E+03	9.499E-02	1.473E+01	4.108E+03	2.760E-01
2085	1.848E+00	1.386E+03	9.311E-02	1.443E+01	4.027E+03	2.706E-01
2086	1.812E+00	1.358E+03	9.127E-02	1.415E+01	3.947E+03	2.652E-01
2087	1.776E+00	1.331E+03	8.946E-02	1.387E+01	3.869E+03	2.600E-01
2088	1.740E+00	1.305E+03	8.769E-02	1.359E+01	3.792E+03	2.548E-01
2089	1.706E+00	1.279E+03	8.595E-02	1.332E+01	3.717E+03	2.498E-01
2090	1.672E+00	1.254E+03	8.425E-02	1.306E+01	3.644E+03	2.448E-01
2091	1.639E+00	1.229E+03	8.258E-02	1.280E+01	3.572E+03	2.400E-01
2092	1.607E+00	1.205E+03	8.095E-02	1.255E+01	3.501E+03	2.352E-01
2093	1.575E+00	1.181E+03	7.934E-02	1.230E+01	3.431E+03	2.306E-01
2094	1.544E+00	1.157E+03	7.777E-02	1.206E+01	3.364E+03	2.260E-01
2095	1.513E+00	1.135E+03	7.623E-02	1.182E+01	3.297E+03	2.215E-01
2096	1.483E+00	1.112E+03	7.472E-02	1.158E+01	3.232E+03	2.171E-01
2097	1.454E+00	1.090E+03	7.324E-02	1.135E+01	3.168E+03	2.128E-01
2098	1.425E+00	1.069E+03	7.179E-02	1.113E+01	3.105E+03	2.086E-01
2099	1.397E+00	1.047E+03	7.037E-02	1.091E+01	3.043E+03	2.045E-01
2100	1.369E+00	1.027E+03	6.898E-02	1.069E+01	2.983E+03	2.004E-01
2101	1.342E+00	1.006E+03	6.761E-02	1.048E+01	2.924E+03	1.965E-01
2102	1.315E+00	9.864E+02	6.627E-02	1.027E+01	2.866E+03	1.926E-01
2103	1.289E+00	9.668E+02	6.496E-02	1.007E+01	2.809E+03	1.888E-01
2104	1.264E+00	9.477E+02	6.367E-02	9.871E+00	2.754E+03	1.850E-01
2105	1.239E+00	9.289E+02	6.241E-02	9.676E+00	2.699E+03	1.814E-01